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ABSTRACT

Enrollments in California's community colleges are expected to increase by 500,000 students by the year 2005 with the student body demographics expected to shift towards higher percentages of minorities and women. To address this issue, the Chancellor's Office staff are examining enrollment projections under varying assumptions about future conditions and running computer simulations to estimate capital outlay needs for the system. This report introduces the Board of Governors of the California Community Colleges' growth plan, developed in response to the board's Basic Agenda calling for plans to accommodate projected enrollment growth as well as three other mandates requiring long-range planning for community colleges. The report presents student population estimates based on current student to population ratios, capital outlay planning based on annual 5-year plans developed by each district, and capital requirement projections modeled using current microcomputer spreadsheet technology. The report states that preliminary computer simulations show the need for 24 new community college campuses to be built by the year 2005 with the expansion and improvement of existing facilities, and that total expenditure needs of the California Community College system will total nearly $3 billion, or roughly $200 million per year for each year between 1990 and 2005. Appendixes summarizing the model results are included. (GFW)

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Long-Range Capital Outlay Plan

by

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Discussed as Agenda Item 4 at a meeting of the Board of Governors of California Community Colleges (Sacramento, CA, September 13-14, 1990).

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LONG-RANGE CAPITAL OUTLAY PLAN 4

First Reading, Action Pending, January Board Meeting

Background

The Board of Governors *1990-91 Basic Agenda* acknowledges the need to "accommodate future growth," noting that ". . . the increasing demand for facilities and operating funds . . . calls for prudent management of limited resources . . ." and that "Plans for growth should be coordinated with the other segments of higher education."

California's population is expected to grow by one-fourth and become far more culturally-diverse by the turn of this century, giving rise to an enrollment increase in community colleges of at least 500,000 students by 2005 – the equivalent of 50 average-sized colleges. While new campuses, facilities, and delivery techniques will be required, many existing campuses are incomplete, existing facilities are aging and becoming obsolete, and equipment is increasingly in need of repair and replacement.

Aside from the Board's own initiatives, three mandates require long-range planning for community colleges. First, the California Postsecondary Education Commission (CPEC) reviews proposed new campuses and centers, using guidelines that require the submission of a letter of intent one year prior to submission of a final proposal. Second, supplemental language in the 1988 Budget Act requires the Board to prepare and submit a systemwide plan for community college growth to CPEC, the Department of Finance (DOF), and the Joint Legislative Budget Committee (JLBC) by December 1990. Third, supplemental language in the 1990 Budget Act requires that proposed new centers and campuses be contained in a long-range systemwide growth plan, and that individual district planning proceed only when the Legislature has approved this plan.

To address this issue, Chancellor's Office staff are examining enrollment projections under alternative assumptions about future conditions and running computer simulations to estimate capital outlay needs for the community college system to 2005. This information was used by CPEC in its January 1990 study, *Higher Education at the Crossroads*. Working with the Chancellor's Office, MGT Consultants have validated the computer model and have completed detailed analyses of local

conditions. This work and consultation with individual districts will help staff develop the required plan.

This agenda item introduces the systemwide growth plan. Since DOF will revise its official enrollment projections for the Community Colleges in October 1990, staff proposes that the Board review details of the proposed plan in November 1990, then take action and submit the final version of the plan in January 1991.

Analysis

Enrollment forecasts are basic to capital outlay planning. Forecasts for the Community Colleges are prepared by DOF using projections of historic participation rates (enrollments divided by population) and applying those rates to expected future population. DOF currently projects community college enrollments to increase from 1.4 million to 1.9 million – an increase of 500,000 students – by the year 2005. This projection will be updated by DOF in October 1990 to reflect the 1989 experience. Since community college enrollments increased by 4.2 percent – a greater rate than the general population change of 2.4 percent – the new projections could exceed the growth projected last year. And, even these revised estimates may be conservative because the population series used by DOF to project enrollments is out of date and probably low. However, new 1990 Census data that could confirm this will not be available until 1991.

Part of the anticipated community college enrollment increase can be met by building and remodeling facilities on existing campuses, extending outreach activities, and developing and applying new techniques for the delivery of instruction and supporting services. The balance of expected future enrollment increases will need to be accommodated at new centers – some of which will become major college campuses – if the Board's goals for quality education and equal access, particularly for historically underrepresented students, are to be achieved. Capital outlays for growth also must be balanced against other substantial needs: to maintain and upgrade existing facilities, to repair and replace equipment, and to provide a complete complement of support facilities on certain campuses.

Funding for capital outlay in the California Community Colleges, University of California (UC), and California State University (CSU) is derived from sale of revenue and general obligation bonds. Bonds authorized in the June 1990 election provide for $450 million in capital outlay expenditures through 1990-91. It is anticipated that another $450 million in bonds to fund 1991-92 capital outlay for public higher education will go before California voters in November 1990.

Recent computer simulations by the Chancellor's Office suggest that even with improved utilization of facilities, the cumulative capital outlay expenditure needs of the Community Colleges will total nearly $3 billion by 2005: an average of nearly

$200 million per year over the 15-year period from 1990 to 2005. Using comparable data, analysis by CPEC shows that the annual capital expenditure need for the three segments of public higher education – UC, CSU, and the Community Colleges – will exceed $500 million per year.

Simulations by Chancellor's Office staff utilize microcomputer spreadsheet technology to compare existing facilities to projections of future enrollments and estimate needed capital outlays to the year 2005. The model estimates the type of outlay (construction, remodeling, maintenance, etc.) and type of facility (lecture, laboratory, office, etc.). Twenty-nine different data elements about existing and future enrollments and existing facilities for each district are entered into the model. This information is then processed by the model using space and utilization standards and 16 capital outlay planning rules and assumptions that staff have developed for this purpose.

The model has been tested and run twice. Results were used by CPEC to characterize community college needs in *Higher Education at the Crossroads.* While CPEC staff was favorable to the work by the Chancellor's Office, it is withholding final judgment on the Community Colleges plan until the general locations for new centers and campuses are identified.

Results of the computer planning model are merely a starting point, which must be supplemented by detailed analysis of unique local plans and conditions. To assist with this more-detailed analysis, the Chancellor's Office has contracted with MGT Consultants. MGT has validated the planning model and analyzed the plans and needs of specific college districts throughout the state. Their findings and conclusions are being reviewed in consultation with individual districts and will help staff develop the proposed systemwide growth plan to the year 2005. Both CPEC and the Legislature now require advanced notice of community colleges' and Board's desire to develop new campuses and centers. This proposed plan should meet that requirement. This will be the first such systemwide growth plan to be developed by the Board of Governors in its 22-year existence.

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Long-Range Capital Outlay Plan

Introduction

The Board of Governors *1990-91 Basic Agenda* recommends seven major objectives, prominent among which is an effort to: "Accommodate projected enrollment growth," noting that

> The rapidly increasing demand for facilities and operating funds to accommodate growing enrollments calls for wise and prudent management of limited resources.

In addition, the *Basic Agenda* calls for a "long-range plan for capital construction in community colleges" and for consideration of:

> . . . both the growth of the state's changing student population and the need for facilities to accommodate that growth when developing the system's budget. Plans for growth should be coordinated with the other segments of higher education.

Community college growth will be stimulated not only by the state's future demography, but also by the Board's goals to improve the access and retention of historically underrepresented students and to play a more significant role in strengthening the economic development of California. Achievement of these goals is essential if community colleges are to help prepare Californians to participate in an ever-more complex and multicultural society.

These and other recommendations on long-range planning are timely for two major reasons.

First, California continues to grow; total state population is expected to increase by nearly one-fourth by the year 2000. Current estimates of future community college enrollment show the system growing by at least 500,000 students over the next 15 years – the equivalent of 50 average-sized colleges.

Those who will constitute the majority of potential new students and workers – women and minorities – traditionally have been underrepresented. At the same time, rapid technological change demands an increasingly skilled work force. The proportion of jobs requiring some postsecondary education is expected to increase from one-half to three-fourths during the 1990s.

This scenario poses major problems. Much of the growth in new jobs will take place in occupations that do not typically employ those who will constitute the bulk of the new work force. Moreover, most of the job growth will take place in occupations with skills that require some postsecondary education.

California's community colleges have a significant role to play in helping solve the mismatch between jobs and workers. These colleges not only provide individuals with transfer and vocational education for most of the new jobs, they also enroll more individuals from the groups that will comprise most of the new workers than do other institutions of postsecondary education. The Board must plan carefully so that college facilities are adequate to handle expected future enrollments.

A second reason for the Board to undertake long-range planning is the call for this work in a number of recent studies and legislative measures. The Commission for the Review of the Master Plan, in its final 1987 report, *The Master Plan Reviewed*, observed that, "Continuing, systematic long-range planning is essential to the efficient and orderly growth of postsecondary education in California." It then recommended that the California Postsecondary Education Commission (CPEC) assume several responsibilities for long-range planning, including the development of common definitions, assumptions, and projections for use by the segments. The Review Commission also recommended that, "The Community Colleges shall be expanded as necessary to accommodate growth in demand for lower-division academic and vocational instruction for credit. . . ."

The Joint Legislative Committee for Review of the Master Plan proposed a number of similar recommendations on long-range planning in its final report, *California Faces . . . California's Future*. This report requests the segments, in consultation with CPEC, to prepare expansion plans to the year 2005. The report goes further to suggest a number of planning guidelines to be used in this work.

Supplemental language in the 1988 Budget Act requires CPEC to develop a report for the Governor and Legislature on policies for new facilities to 2005, including: (1) new versus expanded sites, (2) new delivery techniques, (3) space and utilization standards, (4) year-round operation, and (5) regional approaches. This report, *Higher Education at the Crossroads*, was issued in January 1990. The same Budget Act language also requires each segmental governing board (including the Board of Governors) to prepare enrollment projections through 2005 as a basis for a systemwide plan to be submitted to CPEC, the Department of Finance (DOF), and Joint Legislative Budget Committee by December 1990.

In January 1990, CPEC also revised its Guidelines for the Approval of New Campuses and Centers. Among other major changes in the guidelines is the addition of a requirement that the segments notify CPEC at least one year in advance that a proposed new campus is being planned and will require its approval.

Supplemental language in the 1989 Budget Act proposed that each segment submit a comprehensive five-year capital outlay plan that includes at least the following:

- Campus enrollment projections through 1995;
- Proposed projects in each of the next five years with programmatic and capacity justifications;
- Cost estimates for each project; and
- The relative priority of projects.

These plans were submitted by September 1, 1989, and are to be updated annually.

Finally, supplemental language in the 1990 Budget Act requires that proposals for new community college centers and campuses be contained in the Board of Governors long-range systemwide growth plan and that individual district planning proceed only when the Legislature has approved this plan.

Chancellor's Office staff has worked on the systemwide growth plan during the past year, beginning with the Board's September 1989 Agenda Item 5 on Long-Range Capital Outlay Planning. That item contained a review of planning efforts by the University of California (UC) and California State University (CSU), as well as the Community Colleges; described the computer simulation model developed by staff; and presented initial estimates of future enrollment growth and facilities needs. Since then, staff work has been coordinated closely with CPEC, DOF, UC, CSU, and, more recently, MGT Consultants.

MGT Consultants has validated the Chancellor's Office simulation model, reviewed specific college district plans, and developed findings about the needs of specific geographical areas throughout the state. MGT's work will be reviewed in consultation with individual districts as part of staff's development of a proposed community college growth plan. This plan should meet both legislative and CPEC requirements for the submission and review of new campuses and centers. Preliminary results of these efforts and proposed next steps to prepare the statewide community college growth plan are set forth below.

Enrollment Projections

Enrollment projections are basic to capital outlay planning. For operating budgets, such projections extend no more than two years into the future. However, longer (15- and 20-year) projections are necessary for the orderly planning of new campuses and centers.

By statute, long-term enrollment projections for capital outlay planning in the California Community Colleges are prepared by the DOF. In the DOF model, projections are formulated by applying expected "participation rates " (enrollments divided by population) to projections of future population groups, categorized according to age and gender. The expected participation rates are based on past trends, data from local districts, and a qualitative assessment of each district's situation by DOF staff. These past trends embody not only enrollment demand, but also budget reductions between 1982 and 1984 that severely limited the colleges' ability to enroll and teach students.

DOF is attempting to exclude from the projections the impact of these abnormal budget reductions. However, California's rapid population growth makes enrollment forecasting difficult. During the 1980s, California added 6 million new people to its population. Not only was the state growing faster than the nation as a whole – California accounted for one of every four of the nation's population increase – but it also was growing faster than anyone had predicted. Actual growth turned out to be about one-third higher than DOF had predicted in 1986 (Table 1).

Table 1
Average Annual Population Increase

DOF 1986 Estimate for 1985-90 period	481,000
Actual for 1985-89 period	647,000

The state's growth is expected to continue, but there is no consensus on the exact amount. The Center for the Continuing Study of the California Economy (CCSCE) projects a somewhat higher growth rate than does DOF (Table 2).

Table 2
California Population
(in millions)

	1980	1988	2000
Actual	23.7	28.3	
DOF 1986 Forecast		27.8	32.9
CCSCE 1989 Forecast			34.9

If the higher CCSCE forecast proves to be accurate, California will account for one of every three new Americans during the coming decade. California's population growth is due to (1) natural increase (births less deaths) and (2) foreign and domestic migration. At present, according to DOF estimates, each factor contributes about equally to the state's growth. And, while foreign immigration is highly publicized, domestic migration to California appears to have increased as well.

DOF currently estimates that community college enrollments will increase from 1.4 million in 1990 to nearly 1.9 million by 2005. (See Figure, page 6.) Changes in community college enrollments result from changes in demographics, especially numbers of high school graduates, and economic conditions (as reflected in unemployment), among other factors.

If the population forecast by CCSCE materializes – that is, there are at least 2 million more Californians by 2005 than forecast by DOF – there could be as many as 60,000 more community college students in 2005 than are forecast by DOF (Figure).

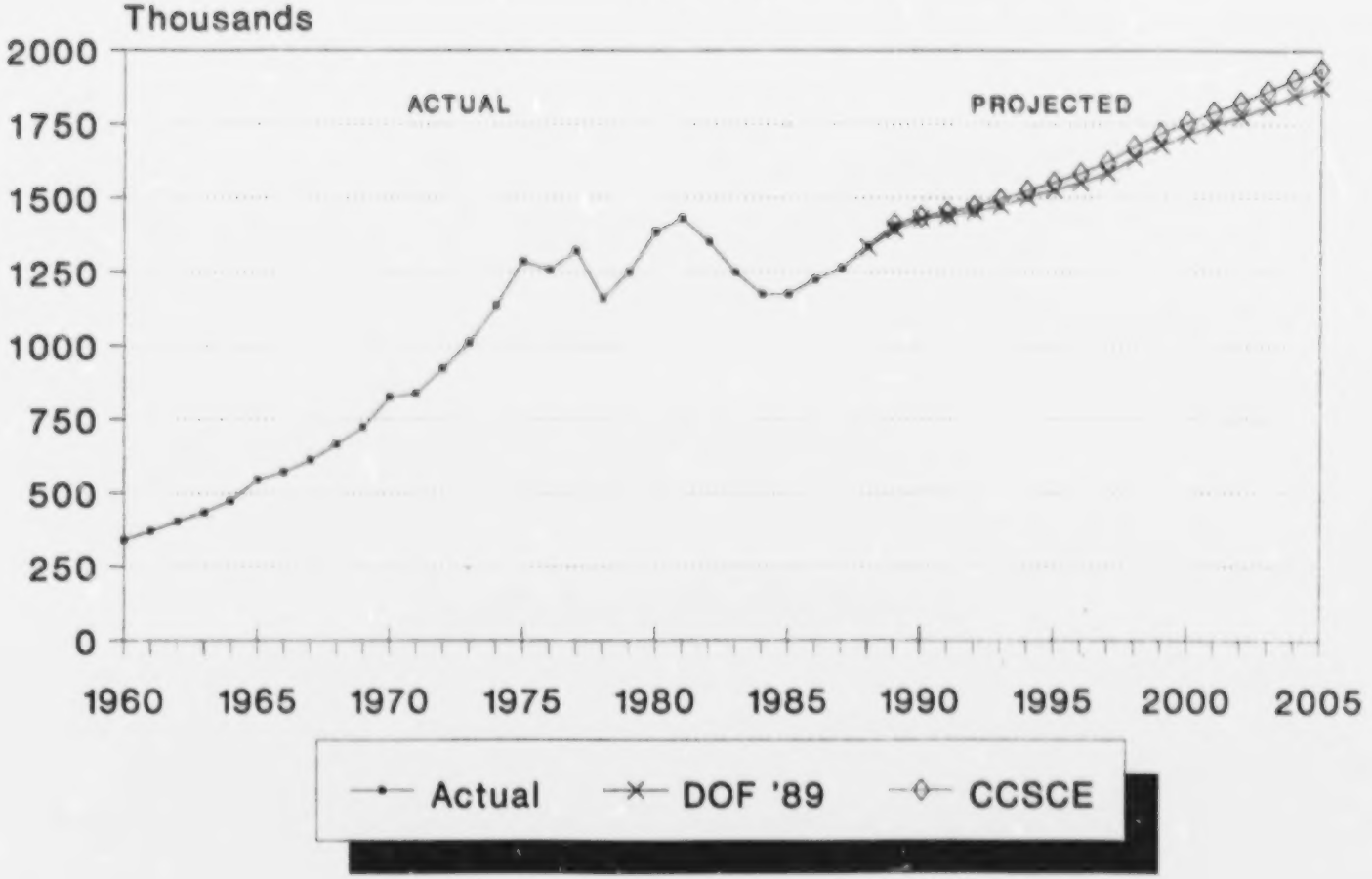
Capital Outlay Planning

Capital outlay planning for California's 107 community colleges is based on the annual five-year plans and project proposals developed by the districts. These plans are reviewed by Chancellor's Office staff, relying largely on DOF enrollment projections, State-approved space utilization standards, and priorities set by the Board of Governors. On the basis of this staff review, the Board develops a list of proposed projects for the immediate budget year, which is then entered into executive and legislative budget processes. (While the first year is emphasized, review also is made of the second through fifth years of district plans.)

Districts also prepare and submit five-year plans for funding deferred maintenance. After Chancellor's Office review and approval, the districts submit detailed proposals for funded first-year projects and then revise and resubmit their five-year plans for the next cycle. Equipment replacement is supported by a separate allocation based on average daily attendance (ADA) and accommodated through the operating budget. Ongoing facility maintenance is supported by the general apportionment.

Current capital outlay planning procedures do not provide a picture of long-term needs or systemwide totals; nor do the current procedures make it possible to easily examine the impact of enrollment alternatives and/or policy changes. To address these problems, Chancellor's Office staff has developed a simulation model, utilizing microcomputer spreadsheet technology, that compares information on existing facilities with forecasts of enrollment and academic loads, and estimates needed future capital outlays to 2005.

Figure
California Community College
Enrollments
1960-2005



An overview of the model appears in Appendix A. Of particular importance to the long-range growth plan are the planning rules utilized in the model to determine when a district should consider a new campus:

- New campuses (or centers to become campuses) are proposed when

  (a) the average size of existing campus(es) in a district exceeds 750 Weekly Student Contact Hours (WSCH) per acre, and

  (b) the district's service area exceeds:

type	square mile per campus
urban	100
suburban	500
rural	1,000

"Campus" means a new location that may start as a center, but which ultimately is expected to become a full-service site, possibly accredited as a college, and which should have sufficient acreage and facilities to support that level of operation.

Districts plan new campuses for several reasons. Population growth may be taking place in a part of the district outside commuting range of existing campuses. Or, an existing campus may not be able to physically accommodate additional students. In some cases, lack of parking spaces may constrain the expansion of an existing campus.

Part (a) of this planning rule is based on improving current practice: the average community college in California enrolls 11,000 students on 150 acres. More (less) acreage and facilities could support more (fewer) students, although other factors may be more important, such as the regional location of programs, topography, and character of existing facilities.

Part (b) of this rule is based on the idea that a commuting time of not more than 30 minutes – including 25 minutes travel and 5 minutes to find parking – to (and from) campus is reasonable. This rule of thumb is applied against expected commuting speeds in different areas to derive the approximate mile radius and square-mile area to be served by each campus. The rule also assumes that the current proportion of instruction taught at off-campus out-reach sites (about one in ten WSCH) will continue.

This planning rule has been validated in a report, *Study to Provide Assistance in the Development of a Long-Range Master Plan for New Community College Campuses*, issued by MGT Consultants in September 1990. MGT's approach was to describe a prototype, full-service community college campus that can accommodate 10,000

students. After detailing and aggregating space requirements, MGT found that 99 acres were required for the 750,000 WSCH generated by the 10,000 students: an average of 750 WSCH per acre, equivalent to the planning rule used in the model.

The model uses enrollment projections for districts that, in turn, are based on projected population changes in the host county. Enrollment change is assumed to take place evenly throughout a district; the model does not distinguish pockets of growth (the more typical phenomenon) or growth at the border of two or more districts. Therefore, discussion of new campuses indicated by the model must include consideration of instances where enrollment growth and facilities needs may be expected at or near the borders of two or more districts.

Besides the problem of uneven population growth, the new-campus planning rule ignores utilization of existing facilities, particular problems of access, and other factors unique to local circumstances. Consequently, *model results must be considered as a point of departure – not the final word – in developing a growth plan.*

Also to be considered in the growth plan are other ways of accommodating growth such as television and computer-aided instruction, the potential of joint use of community facilities, more instruction at the work site, and cooperative efforts with UC and CSU.

Preliminary Results

Chancellor's Office staff has analyzed a preliminary run of the simulation model using an extrapolation of the DOF 1989 enrollment projections for community college districts. This preliminary simulation shows a need for *24 new community college campuses by the year 2005 and another five new campuses by 2010.*

Model calculations show that 12 of the 24 new campuses should be planned or occupied by 1995. Of these twelve, districts already have property, and have approval from CPEC to operate four locations as centers. Altogether, districts have property for 8 of the 24 new campuses that are indicated by 2005.

The existing 107 community college campuses can accommodate an estimated three-fourths of the expected half-million additional students by 2005 (Appendix B). Even with the addition of 24 new centers and campuses, however, existing campuses would grow from their current average of 13,100 students up to 16,500 by 2005. The current average campus size in California is nearly three times larger than the average reported for community colleges elsewhere in the country: less than 5,000 students per college campus. Even the 24 relatively new California campuses would average more than 5,000 students each in 2005.

These estimates assume that the current proportion of instruction taught off-campus in each district will remain constant in the future. As a practical matter, however,

growing districts where existing campuses are overcrowded, but which are not scheduled for a new campus, must either take more instruction off-campus, make greater use of existing campus facilities (if possible), or use other delivery techniques such as television and/or computer-aided instruction (CAI).

The planning rule of 750 WSCH per acre results in a 15 percent improvement in site utilization by 2005:

	1989 Actual	2005 Estimated
On-campus WSCH	10,777,523	14,243,347
Acreage	19,112	21,992
WSCH/Acre	564	650

Improvements in facilities utilization also result. Currently, the community colleges have 31 million assignable square feet (ASF) of facilities for 1.4 million students, or about 22 ASF per student (Appendix B). For the additional 507,000 students expected to enroll by 2005, the planning rules and standards in the model add 5.5 million ASF, or just 11 ASF for each added student – just one-half of the existing allocation of space per student. The overall improvement in facilities utilization between 1989 and 2005 is 14 percent.

From this preliminary run, the cumulative capital outlay expenditure needs for community colleges are estimated at $2.9 billion by 2005 – an average of nearly $190 million per year between 1990 to 2005. These cost estimates, based on an Engineering News Record (ENR) Index of 4828, include:

- Acquire and develop new campus sites $ 422 million
- Construct and equip facilities at these sites $ 752 million
- Remodel, construct and equip facilities at existing campuses $ 1,821 million

Added facilities for enrollment increases and the remodeling and completion of existing facilities at existing community college campuses would cost nearly twice the amount needed to acquire, develop, and begin facilities at 24 new campuses.

MGT Consultants is completing its analysis of model results, district plans, and several other data sources. Its preliminary conclusions indicate that at least 11 new centers and 14 new campuses are needed between 1990 and 2005. Of the 14 new campuses, 10 are projected as beginning as centers to grow into campuses in the mid- to long-term.

Much of the difference between the model results and MGT conclusions has to do with defining the difference between a center and campus.

Capital Outlay Funding

Funding for capital outlay in the Community Colleges, UC, and CSU is derived from the sale of revenue and general obligation bonds. Bonds authorized in the June 1990 election provide for $450 million in capital outlay expenditures through 1990-91. It is anticipated that another $450 million in bonds to fund 1991-92 capital outlay for public higher education will go before California voters in November 1990.

As noted above, recent simulations by the Chancellor's Office suggest that even with improved utilization of facilities, the capital outlay expenditure needs of community colleges will average nearly $190 million per year between 1990 to 2005. Using comparable data, analysis by CPEC shows that the annual capital expenditure need for the three segments of public higher education – UC, CSU and the Community Colleges – will exceed $500 million per year.

During the last large physical plant expansion in the 1960s and early 1970s – the three public segments had access to several sources of support, rather than just revenue and general obligation bonds – the current sources. The State Treasurer's Office estimates that California can market about $2 billion in bonds each year. The segments' needs described above accounts for more than one-fourth of this total. By contrast, the segments share of bonds financed in 1988 was 11 percent. CPEC has concluded that ". . . against other infrastructure needs of the State . . ." it is doubtful that ". . . higher education can more than double its percentage of California's total bonding capacity. . . ."

Concern about California's potential bonded indebtedness is increasing because debt finance is becoming a larger proportion of General Fund revenues. This detracts from current funding needs and could jeopardize California's bond rating (currently AAA, the highest possible) and its ability to sell bonds.

Next Steps

The following steps will be undertaken by Chancellor's Office staff to prepare the draft of a long-range growth plan for the California Community Colleges for Board review in November 1990 and adoption in January 1991:

- Continued review of district proposals in light of model output, MGT study findings, and in consultation with individual districts.
- New computer simulations using DOF October 1990 enrollment projections.
- Incorporation of revisions to proposals in the growth plan, based on the above steps, along with discussion and direction by the Board at its November 1990 meeting.

APPENDIX A

Overview of Chancellor's Office Capital Outlay Simulation Model

Introduction

The Community College Long-Range Capital Outlay Planning Model is a simulation model that utilizes microcomputer spreadsheet technology to compare information on enrollment and existing facilities with projections of future enrollment and academic loads in order to forecast needed capital outlay.

The model is intended to make it possible to examine the long-term capital outlay implications of alternative scenarios in which enrollment forecasts might differ, planning assumptions change, and/or policies about facilities utilization be altered.

The model was constructed by the Research and Analysis Unit of the Chancellor's Office, working closely with the Facilities Planning Unit of that same office. Considerable time was spent in exploring and specifying both written and unwritten rules that govern the planning of capital outlay in California's community colleges. Output from an initial run of the model was compared to recent five-year plans submitted by community college districts and necessary corrections made to the model.

Following the initial test run, the model was run a second time in August 1989 and the results analyzed and presented to the Board of Governors at its September 1989 meeting in Agenda Item 5, "Long-Range Capital Outlay Planning." The model was run again in March 1990, utilizing DOF October 1989 enrollment projections.

The model's structure consists of a *knowledge base*, *inference mechanism*, and *output* for each of the 71 California community college districts. Each run of the model analyzes several different scenarios for each district. The results of these scenarios are then summarized.

The local focus of community colleges makes it necessary to begin the model at the district level before summarizing the results to the statewide level. Use of only a statewide model would not be adequate for this purpose since it would obscure individual district calculations. To illustrate: while some community colleges are "overbuilt" in lecture space (i.e., they have more lecture space than the standards indicate they need), there is still a need to build lecture spaces for other colleges because they are underbuilt. In a statewide approach, by contrast, these situations could cancel each other with the result that no needed lecture space is indicated. The use of district-level data is especially important because community college needs are determined locally, and students are not "redirected" from one college that might be underbuilt to another college that might be overbuilt. (A college service-area level of aggregation was even considered during the model's development, but discarded because of the lack of enrollment forecasts and potential complexity.)

Output

The model produces long-term estimates by type of outlay and facility:

Outlay

- acquire sites and develop new campuses
- construct and equip new facilities
- remodel and alter existing facilities
- maintain existing facilities
- lease and rent off-campus facilities

Facility

- lecture rooms
- laboratories and shops
- audio-visual, radio/television, library spaces
- offices
- supporting spaces

Inference Mechanism

The inference or reasoning mechanism of the model consists of the "macros" (time-saving instructions to the computer), equations, formulas, and functions on the spreadsheet that translate the knowledge base into the output. The inference mechanism is the largest component of the model and, with the exception of the macros, is generally unchanged from one run of the model to another. The macros vary with each run and can introduce changes to the knowledge base (i.e., data, standards, rules, assumptions, etc.); structure alternative enrollment scenarios; or revise the inference mechanism itself.

Knowledge Base

The model's knowledge base consists of:

- Data on district facilities and enrollment;
- Space and utilization standards; and
- Planning rules and assumptions.

Twenty-nine different data elements about existing and future enrollments, existing facilities, and costs for each district are entered into the model. The values entered for all of these elements (like the existing square feet of lecture space) are district-specific.

Space and utilization standards are the same for all districts, and are stated in terms of the square feet of facilities that staff and students require for their activities. Standards for classrooms and laboratories are derived from policies on how many hours per week a room is to be used, how many stations in the room are to be occupied during that time, and the amount of floor space needed for each station. Standards for office, media, and library spaces are based on the number of staff or students for whom the spaces are available. Supporting spaces for which there are no standards are referred to as "noncapacity."

Sixteen planning rules and assumptions are used in the current version of the model. For the most part, these rules and assumptions represent an attempt to quantify existing policies and procedures. In some cases, the rules are unwritten, but rigorously followed by facility planners. In other cases, rules or assumptions may change periodically.

Qualitative "rules of thumb" have been reduced to their approximate quantitative equivalent for use in the model. An illustration of this is the criteria for proposing new community college campuses.

Technical/Physical Aspects of the Model

Currently, the model is running on an IBM PS-2, using Lotus 1-2-3, although it could be adapted to run on other systems with other software.

Physically, the model consists of 71 large worksheets (one for each community college district). When run, these files automatically generate smaller "values" files, each containing a summary of results or output from a different scenario. For further runs of the model, each of the 71 district worksheets is recalculated, again generating the summary output files for each of the scenarios to be examined.

For each run of the model, another set of worksheets summarizes results of the district output files for each of eight regions in the state. A statewide worksheet summarizes the regional results.

APPENDIX B

Capital Outlay Cost Estimates
California Community Colleges
1990 to 2005

1989	Existing Campuses*	New Campuses	Total
Number of Campuses	107	0	107
Enrollment	1,393,662	0	1,393,622
Total ASF	31,145,732	0	31,145,732
2005			
Number of Campuses	107	24	131
Enrollment**	1,771,999	128,146	1,900,145
Total ASF	33,689,605	2,947,358	36,636,963
16-Year Change			
Number of Campuses	0	24	24
Enrollment	378,377	128,146	506,523
Total ASF	2,543,873	2,947,358	5,491,231
Cost Estimates			
Acquire/Develop Sites	$ 0	$ 421,800,000	$ 421,800,000
Construct and Equip	$ 1,821,331,202	$ 751,576,290	$ 2,572,907,492
TOTAL	**$ 1,821,331,202**	**$ 1,173,376,290**	**$ 2,994,707,492**
PER YEAR			**$ 187,169,218**

* Excludes Feather River enrollments, ASF, and costs.

** This enrollment projection was prepared by the Chancellor's Office March 1990 and is based on the DOF 1989 Enrollment Projection through 1998 and an extension of that through 2005, using the average change in DOF participation rates (enrollment/population) from the last five years of the DOF projection.

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